April 10, 2001

Changes in the Composition of Labor
for BLS Multifactor Productivity Measures, 1999

Characteristics of workers evolve over time. Each succeeding generation has completed more years of schooling than the one before. Women have entered the work force in increasing numbers since the late 1950s, continuing a trend seen throughout this century. The large baby boom cohort entered middle age during the 1980s and 1990s, and is now a dominant force in the labor market. Consequently, middle-aged workers have come to account for an ever-larger share of total hours worked, and the average age of workers has risen. Furthermore, the United States economy is currently experiencing a long economic expansion. Because of this strong labor market, employers have been recruiting more workers with fewer skills and older workers have remained on the job.

As a result of these changes, the work force in 1999 is very different from the work force in 1948. And the skill-composition of hours worked today, as measured by a worker's education and work experience, is very different from the distribution of hours worked by level of skill in 1948.

The BLS labor composition index estimates the effect of shifts in the experience, education, and gender composition of the work force on the efficiency of labor, and multifactor productivity growth. The Office of Productivity and Technology assembles data on workers' hours classified by their educational attainment, age and gender. Measures of labor input for private business and private nonfarm business are then calculated by summing the annual percent changes in each group's hours of work, each weighted by that group's share of total labor compensation. These BLS labor composition indexes are reported annually in the Multifactor Productivity Trends news release. A complete description of these measures and methods can be found in Bulletin 2426, Labor Composition and U.S. Productivity Growth, 1948-90.

Recent Changes in Labor Composition

Based on data from the March 2000 Current Population Survey (CPS) of households, the labor composition index for 1999 increased at the following rates:

Sector	1998-1999
Private business	0.62%
Private nonfarm business	0.66%

The charts 1 and 2 show annual changes in the index of labor composition and hours for the private business sector and the private nonfarm business sector since 1979. The rates of growth for the private business and private nonfarm business sectors are very similar because the two sectors cover approximately the same portions of the economy. Private nonfarm business excludes hours in the farm sector from private business, and the farm sector comprises 2 percent of the hours in the total economy. Therefore changes in the composition of hours are virtually identical in the two sectors. For this reason, the private nonfarm business sector is not discussed further.

The 0.62% increase in the labor composition index for the private business sector was more than the 0.52% average annual rate of growth since 1979 and more than twice the rate of increase for 1998. Since 1979, labor composition in private business has accounted for 25 percent of the increase in labor input. Within a growth accounting framework, a 1-percent change in the labor composition index indicates that increases in workers' skill levels have had the same effect on output and productivity growth as a 1-percent change in hours worked.

Table 3 (at the end of this document) disaggregates the sources of labor input growth for the private business sector. While annual changes in labor input as measured by the Current Population survey are dominated by changes in hours, labor composition growth provides a small but steady positive contribution to labor input even in recessions. As a result, labor composition contributes about 20 percent of labor input growth over the 1948-99 period.

Table 1. Changes in the index of labor composition and hours in private business, 1979-99
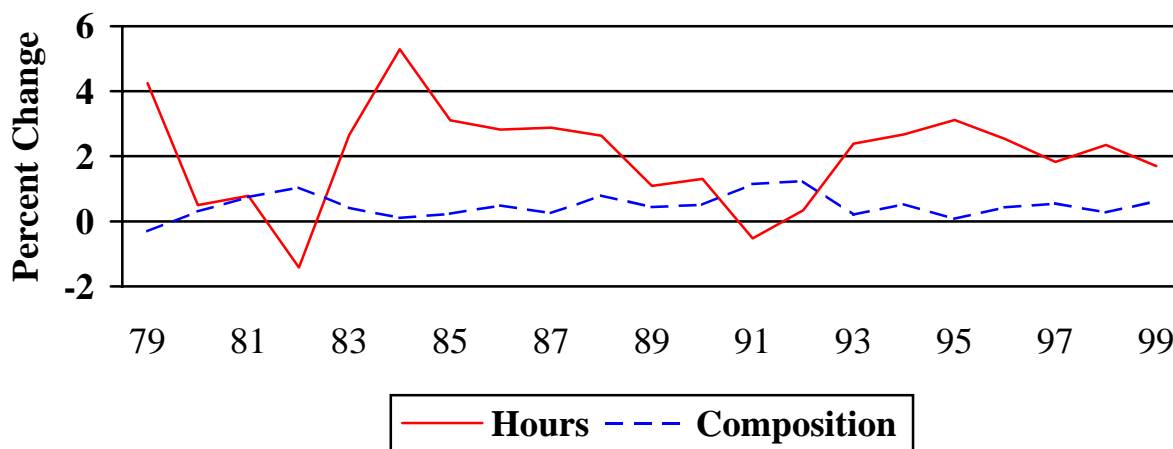
Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

Chart 2. Changes in the labor composition index and hours in private nonfarm business, 1979-99
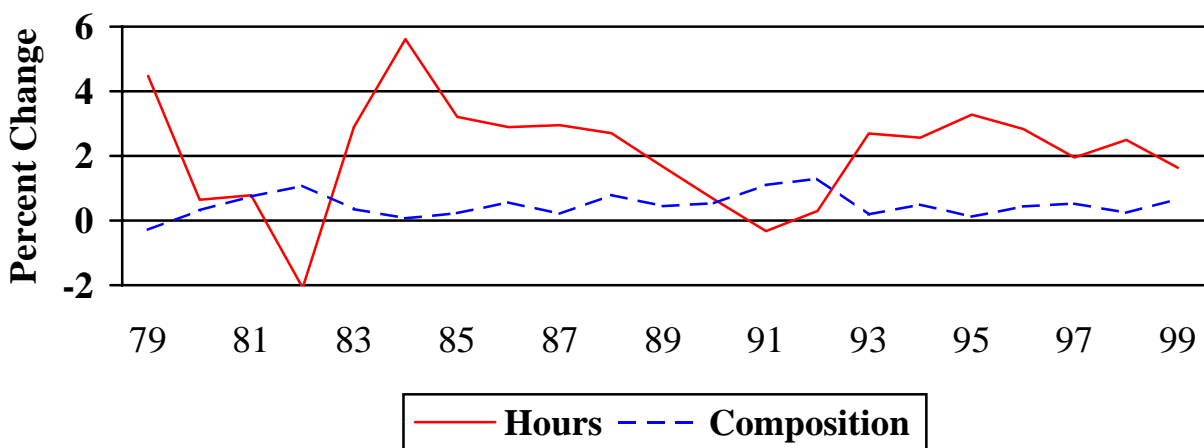
Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

To better understand why these changes are occurring, it is useful to examine changes in educational attainment and work experience within the employed work force. Hours-weighted average levels of educational attainment increased at a fairly steady pace until 1994. In 1995 and 1996, educational attainment failed to advance. Since then it has resumed its upward trend, although at a slower pace than previously. In 1999, average schooling increased more rapidly than in recent years for both men and women. Work experience levels increased rapidly throughout the 1995-98 period, due largely to the aging of the baby boom cohort. In 1999, work experience continued rising at an even faster pace.

As can be seen in the charts above, cyclical effects are also evident in the labor composition index. For example, labor composition index growth rates greater than 1 percent appear in the charts only in the recession years 1982 and 1991-1992. At the beginning of an economic recession, firms generally lay off workers with the least seniority ("last-hired first-fired"). Blue-collar workers usually experience more layoffs than well-educated white-collar workers do. Conversely, economic expansions begin by re-employing many blue-collar workers. As the expansion continues, firms often hire workers with lesser qualifications and workers who were not previously in the labor force. Therefore it is typical for an index of labor composition to increase relatively rapidly during recessions and relatively slowly as economic expansions mature. The seventh year of economic expansion, 1999, appears to be an exception to this pattern as labor composition grew at its fastest rate since 1992.

The role of experienced workers within the current composition of the work force can also be seen in tables on employment, hours, and median weekly earnings that are published by broad age intervals in the Bureau of Labor Statistics publication Employment and Earnings. Compared with overall average growth rates in 1999, these tables show employment grew twice as rapidly among men and women aged 45 or older. This may help explain the sharp increase in work experience levels in 1999. While increases in work experience contributed, gains in educational attainment were the primary source of accelerating labor composition growth in 1999.

Changes in the Distribution of Hours

Table 1 below shows the distribution of hours in the private business sector by educational attainment. The share of hours among men with less than a college degree fell in 1999, and there was a corresponding increase in the share of hours among men with at least a college degree. The share of hours among men with advanced college degrees rose markedly. The hours-weighted average level of educational attainment for men was about 13.3 years over the period 1995-1999. In 1999, this measure of schooling attainment for men rose to 13.42. It appears that after pausing in 1995 and 1996, educational attainment has once again resumed its upward path.

Table 1. Distribution of hours by years of school completed
Men and women in private business 1995-99
(Percent)

Years	Men					Women				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
0-4	1.04	0.95	0.96	0.82	0.89	0.49	0.43	0.51	0.51	0.54
5-8	3.66	3.71	3.40	3.34	3.40	2.23	2.09	2.09	2.04	2.09
9-11	8.05	8.11	7.82	7.76	7.45	6.75	6.46	6.26	6.62	6.37
12	34.50	34.33	34.81	34.50	34.86	36.10	36.69	35.84	35.33	34.51
13-15	26.32	26.03	25.99	25.89	26.25	31.75	31.21	31.54	31.65	32.19
16	17.55	18.05	18.17	18.96	18.90	16.94	17.41	17.59	17.84	18.15
17+	8.89	8.81	8.85	8.74	9.26	5.74	5.71	6.17	6.01	6.16
Mean	13.30	13.31	13.34	13.38	13.42	13.35	13.38	13.42	13.41	13.45

Sum over all schooling levels in each year equals 100 for men and for women.

Among women, the consistent trend has been for college educated women to increase their share of hours, and this trend prevailed again in 1999. The pattern of the last three years has been an increase in the share of hours worked by women with at least some college education at the expense of high school graduates and dropouts. In 1999, each of the three highest education groups (except for a small decline for men with a college degree) increased its share. The largest gains were among women with some college education but no degree. The net result was that hours-weighted average schooling levels for working women increased at about the same rate as men.

Table 2 shows distributions of hours by level of potential work experience, defined as age minus years of completed schooling minus 6. The share of hours for every group of workers with less than 20 years of work experience fell in 1999.

The share of hours worked by the original baby boom generation continues to rise. The population aged 35-54 increased 1.7 percent in 1999 or at a rate faster than the remainder of the population. This most closely corresponds to workers with 20-29 years of potential experience as seen in table 2. For men, workers with 20-29 years of potential experience increased their share nearly one-half percentage point. For women, this share jumped nearly three-quarters of a percentage point.

Furthermore, the population aged 55 and older grew even more rapidly. The labor force participation rate for workers aged 55 or more rose modestly. Finally, unemployment rates declined slightly in 1999 for these workers. For those with 30-39 years of experience, their share of hours fell modestly for men but was essentially unchanged for women. For those with 40 or more years of work experience, their share increased about .25 percentage points.

Inexperienced workers now include some of the children of the baby boom cohort, sometimes designated the "baby boom echo." The population of 16-19 year olds increased about 0.9 percent in 1999 or at nearly the same rate as the entire civilian population. However, employment increased faster for this group than for the rest of the work force as labor force participation rate declines were more than offset by declining unemployment rates. As a result, the share of hours worked by those with less than 5 years of experience continues to show little trend.

Table 2. Distribution of hours by years of potential experience
Men and women in private business, 1995-99

(percent)

Years	Men					Women				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
0-4	12.04	11.64	11.49	11.72	11.70	14.96	14.96	14.65	14.85	14.81
5- 9	13.07	13.03	12.52	12.32	12.01	12.82	12.75	12.66	12.68	12.17
10-14	14.45	14.24	13.73	13.48	13.25	13.70	12.77	12.76	12.38	12.19
15-19	15.39	15.14	15.34	14.63	14.54	14.73	14.31	13.68	13.72	13.42
20-29	24.93	25.36	26.35	26.75	27.17	24.36	24.74	25.32	25.26	26.04
30-39	13.38	14.12	14.25	14.68	14.61	13.59	14.41	14.84	15.19	15.21
40+	6.74	6.47	6.30	6.43	6.72	5.85	6.05	6.08	5.92	6.16
Mean	19.11	19.27	19.40	19.53	19.72	18.45	18.69	18.85	18.84	19.06

The sum over all experience levels in each year equals 100 for men and for women. Potential experience represents the number of years since leaving school (age-schooling-6).

Combining these trends, the average years of potential experience continued to rise in 1999. Among men, average potential experience increased from 19.11 years in 1995 to 19.72 years in 1999. Among women, average potential experience rose from 18.45 years in 1995 to 19.06 years in 1999.

Wage Equation Estimates

The labor composition index may change because of shifts in the distribution of hours employed or because of changes in the relative wage rates received by different groups of workers. For example, suppose that the total hours of highly educated workers are growing more rapidly than the hours of less educated workers. Then, all else equal, an increase in the wage rates of highly educated workers relative to less well-educated workers will result in an increase in the growth rate of the labor composition index. Many studies have shown that returns to schooling and work experience increased throughout the 1980s and early 1990s. These trends are reflected in wage equation parameters that are used to construct the labor composition index.

As noted above, the BLS labor composition indexes are weighted sums of growth rates of hours. A standard human capital wage equation is used to construct the labor cost share weights used in these calculations. Relative earnings by educational attainment based on these parameters are found in the following charts. These parameter estimates capture the wage rate differentials between different categories of workers. Using high school graduates as a reference group, male college graduates, for example, earned approximately 64 percent more than otherwise identical high school graduates while high school drop-outs earned about 16 percent less in 1999. (See Chart 3.)

Chart 3. Earnings of men by educational attainment relative to high school graduates

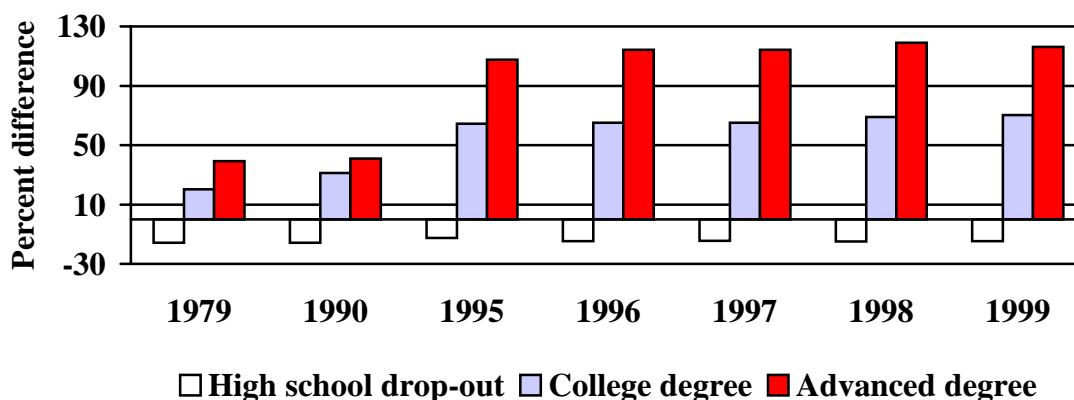**High school drop-out** **College degree** **Advanced degree**
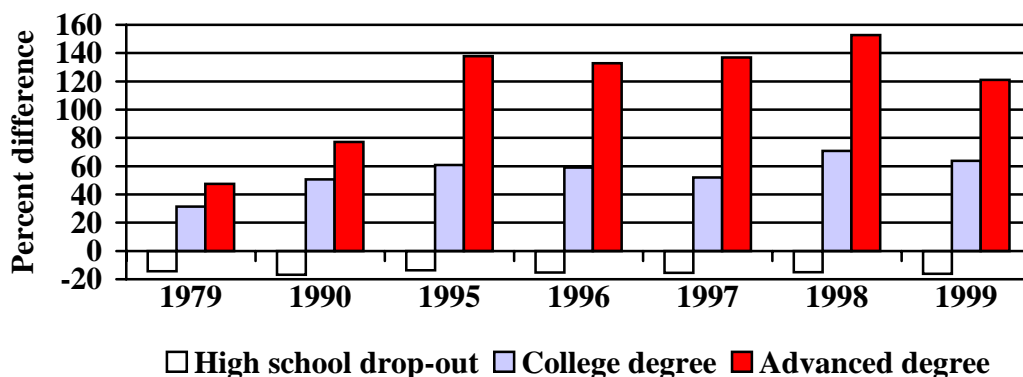
Relative earnings of employees in the private business sector are measured holding all other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

While the relative earnings of more educated workers have been rising since the late 1970s, there had been no discernible trend between 1995 and 1999. The relative earnings of well-educated men appeared to fall in 1999 for both men with college degrees and advanced degrees.

For women, no change in relative earnings is apparent. The earnings of college graduates in 1999 were about 70 percent higher than those of high school graduates and earnings of women with advanced degrees were 116 percent higher. This represents a negligible drop from 1998. (See Chart 4.)

Chart 4. Earnings of women by educational attainment relative to high school graduates

□ High school drop-out ▨ College degree ■ Advanced degree

Relative earnings of employees in the private business sector are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Work experience parameters can be interpreted in a similar fashion, although the exact calculations are slightly more complex. Estimated work experience is modeled using the characteristics of workers and their work histories taken from a sample of Social Security Administration records (see Bulletin 2426, Labor Composition and U. S. Economic Growth, 1948-90). For 1999, men with 5 years of estimated work experience earn 31 percent more than men with no estimated work experience. Men with 25 years of work experience earn about 125% more than inexperienced workers. At some point, additional experience ceases to have any positive effect, and wages may cease to increase or fall for some older workers because of job changes, career changes or other reasons. Thus, on average, workers nearing retirement often have somewhat lower wage rates than those in their late 40s. Chart 5 indicates that men with 35 years of work experience earn more than twice as much as new entrants but less than those with 25 years of work experience.

Chart 5 also shows a compression in the relative earnings of men with different amounts of estimated work experience over the last 5 years. While men with 5 years of work experience continue to earn about 35 percent more than inexperienced workers, the premium paid to workers with 35 years of experience has steadily declined. Men with 15 and 25 years of work experience have experienced some decline in their relative earnings, but most of the decline occurred between 1998 and 1999.
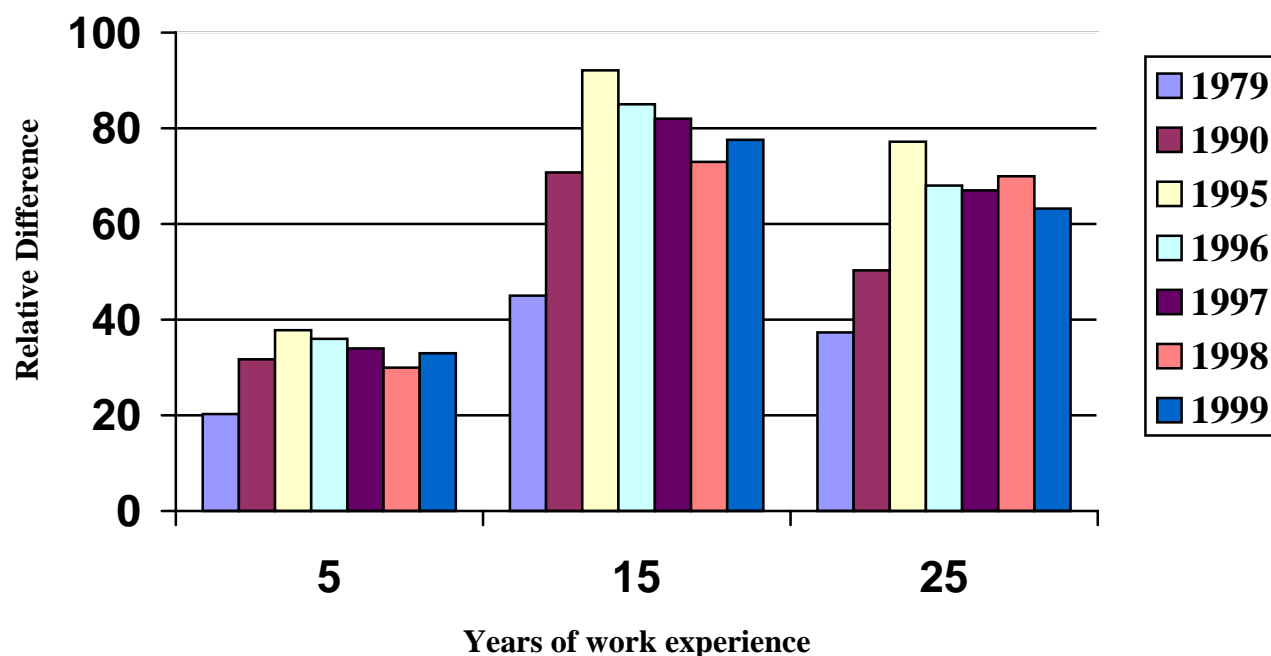
Chart 5. Earnings of men by years of estimated work experience relative to inexperienced workers, 1979-99

Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

For women, estimated work experience has less impact on earnings. Furthermore, over the last 5 years the decline in the return to work experience is less notable. (See Chart 6.) In 1999, women with 5 years of work experience earned about 33 percent more than women without any experience. While this is a small increase over 1998, in the previous 4 years the premium averaged about 35 percent. A similar decline occurred in 1999 for women with 15 years of experience as women earned about than 78 percent more than inexperienced female workers, but they had earned almost 84 percent more in the previous 4 years. For the most experienced workers, women with 25 years, the wage premium fell in 1999 to about 63 percent. The wage premium averaged about 70 percent in the previous 4 years.

Chart 6. Earnings of women by years of estimated work experience relative to inexperienced workers, 1979-99

Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Over the last five years, the wage pattern for all workers exhibits little change across education groups. This contrasts with the growing returns to education between 1979 and 1995 especially for college educated workers. The returns to work experience for men became somewhat more compressed between 1995 and 1999. For women, the narrowing of earnings differences between 1995 and 1999 was small. Furthermore, it is overshadowed by a substantial increase in the returns to work experience between 1979 and 1995. Simulations demonstrate that changes in relative wage rates between 1998 and 1999 had a negligible effect on the labor composition index. Thus the predominant sources of growth in the labor composition index in 1999 were changes in the distribution of hours employed in favor of more experienced and especially more educated workers.

Summary and Conclusions

In 1999, the labor composition index for private business increased 0.62 percent, and it increased 0.66 percent in private nonfarm business. These gains were the largest since 1992. Such gains at this point in the business cycle are somewhat unusual. Labor composition tends to grow more slowly toward the end of the business cycle as employers find it increasingly difficult to find highly qualified workers. Shifts in hours toward more highly educated workers were the primary source of the labor composition growth. Shifts in the composition of hours employed in favor of more experienced workers also made a significant but much smaller contribution to growth in the labor composition index.

Table 3. Sources of labor input growth in private business, 1949-99

(Percentage change)

Year	Labor Input[1,2]	Hours[1]	Labor Composition
1949	-1.41	-1.62	0.21
1950	-2.02	-2.78	0.76
1955	2.47	2.29	0.18
1960	-0.33	-0.84	0.51
1961	0.92	0.37	0.55
1962	1.27	0.33	0.94
1963	0.79	0.57	0.22
1964	1.43	1.38	0.05
1965	1.54	1.64	-0.10
1966	0.60	0.62	-0.02
1967	0.86	0.70	0.16
1968	1.32	1.55	-0.23
1969	1.32	0.97	0.35
1970	-1.48	-1.94	0.46
1971	2.47	2.77	-0.30
1972	3.68	3.63	0.05
1973	2.10	2.29	-0.19
1974	-4.96	-5.60	0.64
1975	2.31	2.27	0.04
1976	3.64	3.90	-0.26
1977	4.59	4.56	0.03
1978	4.88	4.77	0.11
1979	3.94	4.25	-0.31
1980	0.81	0.50	0.31
1981	1.52	0.78	0.74
1982	-0.39	-1.42	1.03
1983	3.07	2.65	0.42
1984	5.40	5.29	0.11
1985	3.34	3.10	0.24
1986	3.31	2.82	0.49
1987	3.14	2.88	0.26
1988	3.42	2.63	0.79
1989	1.52	1.08	0.44
1990	1.81	1.30	0.51
1991	0.62	-0.52	1.14
1992	1.57	0.34	1.23
1993	2.59	2.38	0.21
1994	3.20	2.67	0.53
1995	3.19	3.11	0.08
1996	2.96	2.53	0.43
1997	2.37	1.82	0.55
1998	2.62	2.34	0.28
1999	2.31	1.69	0.62

1. Labor input and hours growth rates are based on data from the Current Population Survey. These growth rates are not the measures used in the calculation of multifactor productivity.

2. The growth rate of labor input equals the growth rates of hours and labor composition.